REMARKS

Claims 1 to 20 remain in the present application. Claims 5, 7, 11 and 14 have been amended for which there is support in the specification, claims and drawings as originally filed.

Reconsideration of the Examiner's decisions and reexamination of this application are respectfully requested.

The §112 rejections:

I. Claims 1 to 20 have been rejected by the Examiner under 35 USC §112, first paragraph. According to the Examiner, the claims have been rejected "because the specification, while being enabling for a seed layer (or seed layer of TIN with a cubic structure) that control the crystal structure of the main layer (or the TaN main layer) as described in [para 16] and [para 17], does not reasonably provide enablement for 'second crystal structure is controlled by the first crystal structure' as recited in claims 1 and 14." The Examiner goes on to state that "Nowhere to find such 'crystal structure is controlled by other such crystal structure' or any indication that the such 'cubic structure' (as noted in [para 17]) is in fact a 'crystal structure.'".

This rejection is without merit. Paragraph 17 clearly states that "a thin seed layer of TIN is put down first with a cubic structure to control the crystal structure of the main layer [i.e., the TaN]." That is, the crystal structure of the second material (i.e, the TaN) is controlled by the crystal structure of the first material (i.e, the TiN). The Examiner also appears to be saying that there is no indication that the "cubic structure" referenced numerous times in the specification is a crystal structure. This is incorrect. It is basic material science that a cubic structure is a type of crystal structure. For the Examiner's

edification, attached to this amendment is a page from the Metals Handbook clearly showing that a cubic structure is a crystal structure.

Withdrawal of this rejection is respectfully requested.

II. Claims 1 to 20 have been rejected by the Examiner under 35 USC 112, second paragraph, as being indefinite.

As to claims 1, 11 and 14, these claims are allegedly indefinite for reciting "said second crystal structure is controlled by the first crystal structure" since there is no cooperative relationship between the two,

According to the teaching of the invention, when you deposit the second material (e.g., TaN) on the first material (e.g., TiN), the second material takes on the crystal structure of the first material. This is not true for all materials but it is true for the materials claimed by Applicants. There are no missing elements. The rejection of claims 1, 11 and 14 is erroneous and should be withdrawn.

As to claim 5, there are allegedly insufficient antecedent basis for "said TIN" and "said TaN".

This rejection is well placed and Applicants have amended claim 5 to provide the antecedent basis.

As to claim 7, there is allegedly insufficient antecedent basis for "said TaN".

This rejection is well placed and Applicants have amended claim 7 to provide the antecedent basis.

As to claim 11, the recitiation of "rho" allegedly renders the claim indefinite.

Claim 11 has been amended to substitute “resistivity” for “rho”.

As to claim 14, there is allegedly insufficient antecedent basis for “said first resistive material” and the recitation of “TCR” allegedly renders the claim indefinite.

Claim 14 has been amended to provide antecedent basis for “said first resistive material” and “TCR” has been spelled out.

In view of the above remarks, the rejection of claims 1 to 20 under 35 USC §112, second paragraph, should now be moot.

The §102 rejections:

Claims 1 and 14 have been rejected by the Examiner under 35 USC §102(b) as being anticipated by Holmes U.S. Patent 3,896,284.

Holmes merely discloses a bilayer resistor. The first layer is typically chromium and the second layer is typically tantalum. There is no disclosure in Holmes, whether explicitly or inherently, that “said second crystal structure is controlled by said first crystal structure” as claimed by Applicants. The materials used by Holmes (chromium or nichrome and tantalum) are different than those used by Applicants. Moreover, there is no basis in Holmes for the Examiner’s statement “wherein the sheet resistivity and temperature coefficient of resistance of the second layer 12 is effectively ‘controlled’ or ‘realized’ by the thickness and cubic structure of the first layer” since there appears to be no disclosure at all in Holmes pertaining to the crystal structure of the first layer. Most importantly, notwithstanding the foregoing erroneous statement by the Examiner, there is no showing by the Examiner where“ said second crystal structure is controlled by said first crystal structure” as claimed by Applicants can be found in Holmes.

For anticipation, every element of the claim must be shown in the reference. Since Holmes does not disclose "said second crystal structure is controlled by said first crystal structure" as claimed by Applicants, Holmes cannot anticipate Applicants' claims 1 and 14.

<u>The §103 rejections:</u>

Claims 4, 11 and 18 have been rejected by the Examiner under 35 USC 103(a) as being unpatentable over Holmes in view of admitted prior art in [para 70] of Applicants' specification.

Inasmuch as claim 4 depends from claim 1, and claim 1 is believed to be patentable, then claim 4 should be patentable as well. No independent ground of patentability is asserted for claim 4 at this time.

Claim 11 is patentable because the Examiner has failed to state a *prima facie* case of obviousness with respect to claim 11. As a matter of fact, the Examiner has failed to provide any rationale whatsoever for the rejection of claim 11. The Examiner has failed to provide any rationale why Holmes renders Applicants' claim 11 obvious and certainly has provided no rationale why Holmes teaches "said second crystal structure is controlled by said first crystal structure" as claimed by Applicants.

Claim 18 claims an embodiment wherein there is a third resistor type which comprises "a single layer of said second resistive material". The Examiner has failed to state a *prima facie* case of obviousness with respect to claim 18 in that the Examiner has failed to provide any rationale whatsoever for the rejection of claim 18. Holmes teaches two types of resistors, namely, a resistor of the first layer only and a resistor of the first and second layers. Holmes, however, fails to teach a resistor having the second layer only.

In view of the preceding remarks, claims 4, 11 and 18 are deemed to be patentable over the cited art.

It is noted that the Examiner has only rejected claims 1 and 14 under 35 USC §102(b) and claims 4, 11 and 18 under 35 USC §103(a). Thus, claims 2, 3, 5 to 10, 12, 13 and 15 to 17 have not been rejected on prior art grounds. In view of the above remarks indicating the rejections of claims 1 to 20 under 35 USC §112 should be either withdrawn or are moot, claims 2, 3, 5 to 10, 12, 13 and 15 to 17 should be in condition for allowance.

Summary:

In view of all of the preceding remarks, it is submitted that all of claims 1 to 20 are in condition for allowance. If the Examiner finds this application deficient in any respect, the Examiner is invited to telephone the undersigned at the Examiner's earliest convenience to resolve such deficiency.

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METALS HANDBOOK

Prepared under the direction of the

METALS HANDBOOK COMMITTEE

Edited by

TAYLOR LYMAN

Published by

THE AMERICAN SOCIETY FOR METALS

Metals Park Novelty, Ohio

Reprinted May 1952
Reprinted January 1954
Reprinted May 1956
Reprinted January 1958
Reprinted April 1960

PRINTED IN THE UNITED STATES OF AMERICA

Coefficient of Linear Thermal Expansion near 20 C, micro-in./°C	Coefficient of Linear Thermal Expansion near 68 F, micro-in./°F	Thermal Conductivity near 20 C, cal/sq cm/cm per deg Cent/sec	Electrical Resistivity, microhm-cm	Modulus of Elasticity in Tension, 10^6 psi	Crystal Structure	Lattice Constants at 20 C (68 F), kX-units† a	b	c or Axial Angle or Temp	Closest Approach of Atoms	Element
....	....	....	....	....	....	.....	....	....	....	..... Actinium
(e)23.9	(e)13.3	0.53	2.655 (20 C)	10	Face-centered cubic	4.0408	....	....	2.856	... Aluminum
....	....	....	....	....	....	.....	....	....	....	... Americium
(b)(c)8.5 to 10.8	(b)(c)4.7 to 6.0	0.045	39.0 (0 C)	11.3	Rhombohedral	4.4974	....	57°6.5′	2.898	.... Antimony
....	....	0.406×10^{-4}	....	....	Face-centered cubic	5.42	....	(−233 C)	3.83	.... Argon
4.7	2.6	....	35 (0 C)	....	Rhombohedral*	4.151	....	53°49′	2.50	...... Arsenic
....	....	....	....	....	....	.....	....	....	....	..... Astatine
....	....	....	....	....	Body-centered cubic*	5.015	....	....	4.34	..... Barium
(j)12.4	(j) 6.9	0.38	5.9 (0 C)	37	Close-packed hexagonal*	2.2810	....	3.5771	2.221	.... Beryllium
13.3	7.4	0.020	106.8 (0 C)	4.6	Rhombohedral	4.7361	....	57°14.2′	3.105	..... Bismuth
(k)8.3	(k) 4.6	....	1.8×10^{12} (0 C)	....	Orthorhombic (?)	17.86	8.93	10.13	....	.... Boron
....	....	....	....	....	Orthorhombic	4.48	6.67	8.72 (−150 C)	2.27	..... Bromine
29.8	16.6	0.22	6.83 (0 C)	8	Close-packed hexagonal	2.9727	....	5.606	2.972	..... Cadmium
22	12	0.3	3.43 (0 C)	3	Face-centered cubic*	5.56	....	....	3.93	..... Calcium
(e)0.6 to 4.3	(e) 0.3 to 2.4	0.057	1375 (0 C)	0.7	Hexagonal*	2.4564	....	6.6906	1.42	...... Carbon (graphite)
....	....	....	78 (20 C)	....	Face-centered cubic*	5.143	....	....	3.64	.... Cerium
97	54	....	18.83 (0 C)	....	Body-centered cubic	6.05	....	(−173 C)	5.24	...... Cesium
....	....	0.172×10^{-4}	....	....	Tetragonal	8.56	....	6.12 (−185 C)	1.81	..... Chlorine
6.2	3.4	0.16	13 (28 C)	36	Body-centered cubic*	2.8787	....	....	2.493	.... Chromium
12.3	6.8	0.165	6.24 (20 C)	30	Close-packed hexagonal*	2.502	....	4.061	2.501	...... Cobalt
7.1	4.0	....	13.1 (18 C)	....	Body-centered cubic	3.2941	....	....	2.853	.. Columbium
16.5	9.2	0.94	1.673 (20 C)	16	Face-centered cubic	3.6080	....	....	2.551	.... Copper
....	....	....	....	....	....	.....	....	....	....	.... Curium
....	....	....	....	....	Close-packed hexagonal	3.578	....	5.648	3.499	.. Dysprosium
....	....	....	....	....	Close-packed hexagonal*	3.532	....	5.589	3.459	...... Erbium
....	....	....	....	....	Body-centered cubic	4.573	....	....	3.960	... Europium
....	....	....	....	....	....	.....	....	....	....	..... Fluorine
....	....	....	....	....	....	.....	....	....	....	..... Francium
....	....	....	....	....	Close-packed hexagonal	3.622	....	5.748	3.554	.. Gadolinium
18	10	....	53.4 (0 C)	....	One-face-centered orthorhombic	4.517	4.511	7.645	2.437	...... Gallium
....	....	....	89,000 (0 C)	....	Diamond cubic	5.647	....	....	2.445	.. Germanium
14.2	7.9	0.71	2.19 (0 C)	12	Face-centered cubic	4.0701	....	....	2.878	.... Gold
....	....	....	....	....	Close-packed hexagonal*	3.200	....	5.077	3.14	..... Hafnium
....	....	3.32×10^{-4}	....	....	Close-packed hexagonal (?)	3.57	....	5.83 (−271.5 C)	3.57	.... Helium
....	....	....	....	....	Close-packed hexagonal	3.557	....	5.620	3.480	..... Holmium
....	....	4.06×10^{-4}	....	....	Hexagonal	3.75	....	6.12 (−271 C)	....	.... Hydrogen
....	....	....	....	....	....	.....	....	....	....	..... Illinium
33	18	0.057	8.37 (0 C)	....	Face-centered tetragonal	4.585	....	4.941	3.24	...... Indium
93	52	10.4×10^{-4}	1.3×10^{15} (20 C)	....	Orthorhombic	4.777	7.251	9.773	2.70	...... Iodine
6.8	3.8	0.14	5.3 (20 C)	75	Face-centered cubic	3.8312	....	....	2.709	...... Iridium
11.7	6.5	0.18	9.71 (20 C)	28.5	Body-centered cubic*	2.8606	....	....	2.476	.... Iron
....	....	0.21×10^{-4}	....	....	Face-centered cubic	5.68	....	(−191 C)	4.02	...... Krypton
....	....	....	59 (18 C)	....	Close-packed hexagonal*	3.754	....	6.063	3.73	.. Lanthanum
(e)29.3	(e)16.3	0.083	20.65 (20 C)	2.6	Face-centered cubic	4.9395	....	....	3.493	.... Lead
56	31	0.17	8.55 (0 C)	....	Body-centered cubic	3.5019	....	....	3.033	...... Lithium
....	....	....	....	....	Close-packed hexagonal	3.509	....	5.559	3.439	..... Lutecium
(m)26	(m)14	0.38	4.46 (20 C)	6.5	Close-packed hexagonal	3.2028	....	5.1998	3.190	.. Magnesium
22	12	....	185 (20 C)	23	Cubic* (complex)	8.894	....	....	2.24	.. Manganese
....	....	0.0201	94.1 (0 C)	....	Rhombohedral	2.999	....	70°31.7′(−46 C)	2.999	..... Mercury
(e) 4.9	(e) 2.7	0.35	5.17 (0 C)	50	Body-centered cubic	3.140	....	....	2.720	. Molybdenum
....	....	....	79 (18 C)	....	Close-packed hexagonal*	3.650	....	5.890	3.62	.. Neodymium
....	....	0.00011	....	....	Face-centered cubic	4.52	....	(−268 C)	3.20	.... Neon
....	....	....	....	....	....	.....	....	....	....	... Neptunium
(e)13.3	(e) 7.4	0.22	6.84 (20 C)	30	Face-centered cubic	3.5167	....	....	2.486	.... Nickel
....	....	0.000060	....	....	Hexagonal*	4.03	....	6.59 (−234 C)	....	..... Nitrogen
4.6	2.6	....	9.5 (20 C)	80	Close-packed hexagonal	2.7298	....	4.3104	2.670	..... Osmium
....	....	0.000059	....	....	Cubic*	6.83	....	(−225 C)	....	..... Oxygen
11.8	6.6	0.17	10.8 (20 C)	17	Face-centered cubic	3.8824	....	....	2.745	... Palladium
125	70	....	10^{17} (11 C)	....	Cubic*	7.17	....	(−35 C)	....	.. Phosphorus (yellow)
8.9	4.9	0.17	9.83 (0 C)	21	Face-centered cubic	3.9158	....	....	2.769	..... Platinum
....	....	....	....	....	....	.....	....	....	....	.... Plutonium
....	....	....	....	....	(probably) Monoclinic ($\beta = 92°$)	7.42	4.29	14.10	3.4	.... Polonium
83	46	0.24	6.15 (0 C)	....	Body-centered cubic	5.333	....	....	4.618	.... Potassium
....	....	....	88 (18 C)	....	Close-packed hexagonal*	3.662	....	5.908	3.633	Praseodymium
....	....	....	....	....	....	.....	....	....	....	Protoactinium
....	....	....	....	....	....	.....	....	....	....	...... Radium
....	....	....	....	....	....	.....	....	....	....	.... Radon
....	....	....	....	....	Close-packed hexagonal	2.7553	....	4.4493	2.734	..... Rhenium
(e) 8.3	(e) 4.6	0.21	4.5 (20 C)	42	Face-centered cubic*	3.7957	....	....	2.684	..... Rhodium
90	50	....	12.5 (20 C)	....	Body-centered cubic	5.62	....	(−173 C)	4.87	.... Rubidium
9.1	5.1	....	7.6 (0 C)	60	Close-packed hexagonal*	2.6984	....	4.2730	2.644	... Ruthenium
....	....	....	....	....	....	.....	....	....	....	... Samarium
....	....	....	....	....	Face-centered cubic*	4.532	....	....	3.205	.... Scandium
37	21	....	....	....	Hexagonal*	4.3552	....	4.9494	2.32	.... Selenium
2.8 to 7.3	1.6 to 4.1	0.20	10^5 (0 C)	16	Diamond cubic	5.4173	....	....	2.346	.... Silicon
(o)19.7	(o)10.9	(m)1.0	1.59 (20 C)	11	Face-centered cubic	4.0774	....	....	2.882	.... Silver
71	39	0.32	4.2 (0 C)	....	Body-centered cubic	4.2820	....	....	3.708	.... Sodium
....	....	....	23 (20 C)	....	Face-centered cubic*	6.075	....	....	4.30	..... Strontium
64	36	6.31×10^{-4}	2×10^{23} (20 C)	....	Face-centered orthorhombic*	10.48	12.92	24.55	2.12	.... Sulfur (yellow)
6.5	3.6	0.13	12.4 (18 C)	27	Body-centered cubic	3.2959	....	....	2.854	..... Tantalum
....	....	....	....	....	....	.....	....	....	....	.. Technetium
16.8	9.3	0.014	2×10^5 (19.6 C)	6	Hexagonal	4.4469	....	5.9149	2.86	.... Tellurium
....	....	....	....	....	Close-packed hexagonal	3.585	....	5.664	3.508	..... Terbium
28	16	0.093	18 (0 C)	....	Close-packed hexagonal*	3.450	....	5.514	3.401	..... Thallium
(e)11.1	(e) 6.2	....	19 (20 C)	....	Face-centered cubic	5.077	....	....	3.59	...... Thorium
....	....	....	....	....	Close-packed hexagonal	3.523	....	5.564	3.446	..... Thulium
23	13	0.16	11.5 (20 C)	6	Body-centered tetragonal*	5.8194	....	3.1753	3.016	.... Tin
8.5	4.7	....	80 (0 C)	16.8	Close-packed hexagonal*	2.953	....	4.729	2.91	..... Titanium
4.3	2.4	0.48	5.5 (20 C)	50	Body-centered cubic*	3.1585	....	....	2.734	.... Tungsten
....	....	0.064	60 (18 C)	....	Orthorhombic*	2.852	5.865	4.945	2.76	..... Uranium
7.8	4.3	....	26 (20 C)	....	Body-centered cubic	3.033	....	....	2.627	.... Vanadium
....	....	1.24×10^{-4}	....	....	Face-centered cubic	6.24	....	(−185 C)	4.41	.... Xenon
....	....	....	....	....	Face-centered cubic	5.468	....	....	3.866	... Ytterbium
....	....	....	....	....	Close-packed hexagonal	3.663	....	5.814	3.59	...... Yttrium
(h)39.7	22.1	0.27	(s)5.916 (20 C)	(t)	Close-packed hexagonal	2.659	....	4.935	2.659	.... Zinc
5	3	....	41.0 (0 C)	11	Close-packed hexagonal*	3.223	....	5.123	3.16	... Zirconium

(*For footnotes, see page 19.*)